

12

**EUROPEAN PATENT APPLICATION**

21 Application number: 83201291.8

51 Int. Cl.<sup>4</sup>: **E 05 B 15/00**  
**E 05 B 47/00**

22 Date of filing: 07.09.83

43 Date of publication of application:  
20.03.85 Bulletin 85/12

64 Designated Contracting States:  
DE FR IT NL SE

71 Applicant: Chubb Security Installations Limited  
51 Whitfield Street  
London W1P 6AA(GB)

72 Inventor: Cahill, Dermot Joseph  
137 Kimbolton Road  
Bedford MK41 8DT(GB)

74 Representative: Coles, Graham Frederick  
Manor House Manor Lane  
Feltham Middlesex TW13 4JQ(GB)

64 Locks.

57 A lock includes a solenoid-operated striker unit (4) for capturing pin-bolts (9) of the shot bolt assembly (3) of a key-operable locking mechanism (1) of a hinged door (2). The pin-bolts (9) are captured within a keep channel-member (13) that slides up and down within a fixed channel-member (10) between an upper, release position in which slots (14) in the member (13) are in register with slots (11) in the member (10) and a lower, locking position in which the slots (14) are out of register with the slots (11). The member (10) is set perpendicularly to the general plane of swing of the door (2), the pin-bolts (9) being free to move into and out of the channel-member (13) through the aligned slots (11, 14) when that member has been lifted into its release position by the solenoid (17) or a manually-actuable lever (27). A catch (19) latches the member (13) in this position until released, allowing the member (13) to move to its locking position under spring action, in response to entry of the uppermost pin-bolt (9) into the striker unit (4). According to a modification a catch (31) is released by a forwardly-offset pin-bolt (32), and a keep member (30) slides up and down behind an apertured bar (29) rather than within a channel member. Also according to an alternative, a solenoid-lifted cylindrical keep-member (41) rotates about its longitudinal axis in admitting pin-bolts (44) to, and releasing them from, axially-directed slots (46) that capture the pin-bolts (44) when the member (41) moves downwardly under resilient bias.

-1-

Locks

The present invention relates to locks of the kind in which a bolt member is engaged with a keep member of the lock to  
5 restrain the bolt member from movement in a predetermined path with respect to the keep member, and the keep member is displaceable to free the bolt member for said movement.

Locks of the above-specified kind are known for use where  
10 passage through a doorway into offices or other premises is to be controlled remotely, and in this respect it is common to utilize a conventional key-operated or latching lock-mechanism on the door that engages its bolt within an electrically-releasable keep member in the form of a  
15 striker box on the door frame. Such box either pivots as a whole, or has as one of its sides a flap that pivots, under control of a solenoid mounted in the door frame. The bolt of the lock mechanism is retained by the striker box to preclude opening of the door until such time as the solenoid is  
20 energised electrically, whereupon the box or the flap pivots to release the bolt and thereby free the door for opening. However there is the disadvantage that any attempt to force

the door open, loads the pivot-mounting of the box or flap-side, together with the solenoid-operated mechanism associated with it, making the lock very vulnerable in this respect.

5

It is one of the objects of the present invention to provide a lock of the said above-specified kind that may be used to reduce vulnerability to forcing and generally to improve security.

10

According to the present invention, a lock of said above-specified kind is characterised in that the keep member is displaceable transversely of said path between a first position in which it blocks said path to restrain the bolt member as aforesaid, and a second position in which it is clear of said path to free said bolt member for movement in said path.

The keep member may be a member, for example a channel member, having an upstanding wall that serves to block said path when the keep member is in its first position, and in these circumstances the wall may be apertured such as to enable the bolt member to pass out from behind the wall when the keep member is in its second position. More especially the keep member in these latter circumstances may be located behind a fixed upstanding wall (provided as such or, for example, as the front wall of a channel member in which the keep member is arranged to slide) that extends across said path and is apertured to enable the bolt member to move freely in that path; the one or more apertures in the keep member will be in register with the one or more apertures in the fixed wall when the keep member is in its second position but not when it is in its first position. The fixed wall will provide a structural abutment for the keep member against which to resist loads applied to the keep member when it is in its first position capturing the bolt member.

As an alternative, the keep member may be arranged for both angular and axial displacement such that the first and second positions are separated from one another both longitudinally and angularly with regard to such axis.

5

Displacement of the keep member between its first and second positions may be effected by an electrically-energizable solenoid or by mechanical or other means.

- 10 The bolt member of the lock may comprise a plurality of mutually-spaced pin-bolts or other discrete elements for engaging with the keep member, and may be the bolt of a key-operable lock mechanism such that it can be withdrawn by key-operation of that mechanism. The involvement of a key-
- 15 operable mechanism is not essential and the bolt member may simply be a fixed, non-withdrawable member that engages with the keep member.

Examples of electrically-releasable locks in accordance with  
20 the present invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a front elevation of a first example of an  
electrically-releasable lock in accordance with the present  
25 invention;

Figure 2 is a side elevation of the first electrically-releasable lock taken in the direction of the arrow II of  
Figure 1;

30

Figure 3 is an enlarged sectional plan view of the lock of Figures 1 and 2;

Figure 4 illustrates the key-operable locking mechanism and bolt assembly of the lock of Figures 1 and 2;

Figures 5 and 6 show parts of the striker unit of the lock of Figures 1 and 2 in their relative locations appropriate to successive locking and release positions, respectively, of the lock;

Figure 7 is a side elevation of the striker unit of a modified form of the lock of Figures 1 and 2;

Figure 8 is an end view of the bolt assembly of the modified form of lock; and

Figure 9 illustrates a second example of electrically-releasable lock in accordance with the present invention.

Referring to Figures 1 to 4, the first example of lock comprises a key-operated locking mechanism 1 which is mounted in a hinged door 2 and which has a bolt assembly 3, and a striker unit 4 which is mounted in the frame 5 of the door 2 to engage with the extended or shot bolt assembly 3 and thereby retain the door 2 locked closed. The lock mechanism 1 in this embodiment of the invention is that of a conventional mortice lock 6 having a dead bolt 7 which, as part of the bolt assembly 3, is fitted with an extension piece 8 that provides three spaced pin-bolts 9 for engagement with the striker unit 4.

The striker unit 4 incorporates a fixed channel-member 10, illustrated in Figures 5 and 6, that is set perpendicularly to the general plane of movement of the bolt assembly 3 in the opening-closing swing of the hinged door 2. Three slots

11 in the front upstanding wall 12 of the channel-member 10 are aligned with the three pin-bolts 9, respectively, of the bolt assembly 3, so as to allow the pin-bolts 9 to pass freely through the wall 12 upon closing or opening of the door 2 with the bolt 7 shot. A keep channel-member 13 that also has three slots 14 in its front upstanding wall 15, is mounted to slide up and down within the channel-member 10, between an upper position in which the three slots 14 are in register with the three slots 11 respectively (as illustrated in Figure 6), and a lower position in which the two sets of slots 14 and 11 are out of register with one another (as illustrated in Figure 5). The keep channel-member 13 is coupled via a rod 16 to a solenoid 17 to be lifted into the upper, release position against the action of a spring 18, when the solenoid 17 is energised electrically.

While the door 2 is closed with the bolt 7 shot, the three pin-bolts 9 project into the keep channel-member 13. If the keep channel-member 13 is then in its lower, locking position (illustrated in Figure 5) the slots 11 are blocked by the wall 15 of the channel-member 13 so that opening of the door 2 is precluded. Opening of the door 2 remains precluded in this way until either the lock mechanism 1 is operated by means of its key to withdraw the pin-bolts 9 from engagement within the channel-member 13, or the solenoid 17 is energised to lift the channel-member 13 to its upper, release position. When the solenoid 17 is energised and the channel-member 13 is thereby lifted into the release position (illustrated in Figure 6) the slots 14 are brought into register with the slots 11. This unblocks the paths of the pin-bolts 9 through the slots 11 and consequently allows the door 2 to be opened.

Provision is made for latching the keep channel-member 13 up in its release position once the solenoid 17 has been energised to free the door 2, until the door 2 is closed again. To this end, and with particular reference to Figures 5 and 6, a spring-biased catch 19 projects through a slot 20 in the rear upstanding wall 21 of the channel-member 10 and a corresponding slot 22 in the rear upstanding wall 23 of the channel-member 13. While the channel-member 13 is in its lower, locking position (Figure 5) there is overlap between the slots 20 and 22 but only to an extent to allow a finger-element 24 of the catch 19 to project through the wall 23 into alignment with one, in this embodiment the uppermost, slot 11. However when the channel-member 13 is lifted by energisation of the solenoid 17 into its release position (Figure 6), the slot 22 moves into register with the slot 20. This allows the body 25 of the catch 19 to enter the slot 22 under the action of its biasing spring 26, and so latch the channel-member 13 in its release position with the slots 11 and 14 in register with one another.

20

Closing of the door 2 returns the pin-bolts 9 to pass through their respective aligned slots 11 and 14 into the channel-member 13. The uppermost pin-bolt 9 strikes the projecting finger-element 24 displacing the body 25 of the catch 19 back against its spring 26 out of the slot 22. This releases the channel-member 13 to move downwardly under the action of the spring 18, to its locking position (Figure 5) in which the pin-bolts 9 are trapped within the keep channel-member 13, locking the door 2 closed. The spring-biased abutment of the finger-element 24 with the uppermost pin-bolt 9 within the channel-member 13, ensures that the pin-bolts 9 are held positively against the front wall 15 of the channel-member 13 while the channel-member 13 is in its locking position. Also

it ensures that the pin-bolts 9 will release cleanly from the striker unit 4 when the solenoid 17 is energised to bring the slots 11 and 14 into register with one another again to free the door 2 to open.

5

Any attempt to force the door 2 open while the channel-member 13 is in its locking position, acts through the pin-bolts 9 upon the front wall 15 of the channel-member 13 and thence upon the front wall 12 of the fixed channel-member 10. Since 10 the walls 15 and 12 are at right angles to the direction of movement of the channel-member 13, such action is ineffective to load the solenoid 17 and its intercoupling rod 16. The security of the lock is thus not dependent ultimately on the load-resistance of the operating mechanism of the striker 15 unit 4, but rather on that of a structural item, namely the fixed channel-member 10, that provides the strike abutment for the bolt assembly 3.

The provision of the mutually-spaced pin-bolts 9 (rather than 20 of a comprehensive, single bolt dimensioned to provide comparable strength) to engage the striker unit 4, has the advantage that the stroke of the solenoid 17 required to release the lock, is reduced. It also has advantage from the security point of view since any attempt to force the lock by 25 firearm attack for example, is less likely to free the bolt assembly 3 from retention within the striker unit 4.

The striker unit 4 includes provision for opening the door 2 from the inside in the event of an emergency or other 30 condition. To this end a pivoted lever 27 (Figure 2) is provided at the rear of the striker unit 4 to engage, when depressed, with the rod 16. Such engagement lifts the rod 16 so as to move the channel-member 13 to be latched in its



upper, release position in the same manner as upon energisation of the solenoid 17, until reset by re-closing of the door 2. The lever 27 pivots upon each operational movement of the channel-member 13 during normal electrical  
5 actuation of the lock, thereby providing a continual checking indication of the functionality of the lever 27 for emergency use.

A modified form of the lock described above with reference to  
10 Figures 1 to 6 is shown in Figures 7 and 8. In this modified form, as shown in Figure 7, a slotted bar 29 provides the strike abutment for the correspondingly-slotted keep channel-member 30. Also, the latching of the keep channel-member 30 is effected by a catch 31 that is located to be engaged by  
15 the middle of the three pin-bolts. The middle pin-bolt 32, as shown in Figure 8, is slightly out of alignment with the upper and lower pin-bolts 33 such that it enters the keep channel-member 30 slightly in advance of them. This ensures positive release of the latch, and thereby of the channel-  
20 member 30 into its locking position. It also ensures spring-biased retention of the pin-bolts 32 and 33 fast within the channel-member 30, so as to provide a positive release action when the channel-member 30 is returned to its upper, release position.

25

With the modified form of striker unit shown in Figure 7, the channel-member 30 is urged towards its locking position by a spring 34 that acts on an emergency-release lever 35. The lever 35 as acted upon by the spring 34, bears down at its  
30 inner end 36 on a pin 37 that projects from a rod 38 which intercouple the channel-member 30 with the operating solenoid 39. Depression of the lever 35 against the action

of the spring 34 for emergency release of the lock brings the inner end 36 of the lever 35 into engagement with the solenoid core 40 to effect the lifting required of the channel-member 30 for latching it in its release position.

5

The keep member in each of the two forms of lock described above is of channel section, but this is not an essential of the present invention. A form of lock utilizing a cylindrical keep member is illustrated in Figure 9 and will  
10 now be described.

Referring to Figure 9, the cylindrical keep member 41 is coupled with the solenoid (not shown) by a rod 42 that provides for axial displacement of the member 41 from an  
15 upper, release position, in which three arcuate guide slots 43 cut in the cylindrical surface of the member 41 are aligned (through slots in a fixed casing not shown) with the three pin-bolts 44 of the locking mechanism 45, to a lower, locking position. The member 41 is mounted for rotation  
20 about its longitudinal axis, and the extended pin-bolts 44 enter the slots 43 laterally upon closing movement of the door so that they urge the member 41 to rotate through ninety degrees during completion of the closing movement. The pin-bolts 44 are by this rotation entered into axially-directed  
25 slots 46 in the cylindrical surface of the member 41, thereby allowing the member 41 to be displaced downwardly into its locking position in which the pin-bolts 44 are trapped within the member 41 to lock the door. This downward displacement takes place under the action of resilient bias that is  
30 provided by a mechanism (not shown) that responds to the ninety-degree rotation of the member 41. Energisation of the solenoid lifts the member 41 to its release position against

the action of this bias, returning the pin-bolts 44 to the arcuate slots 43. Movement to open the door (which may be urged by the member 41 under the action of a spring that is wound up during rotation of the member 41 upon closing of the  
5 door) rotates the member 41 back to free the pin-bolts 44 from the slots 43.

CLAIMS

1. A lock in which a bolt member (9;32,33;44) is engaged with a keep member (13;30;41) of the lock to restrain the bolt member (9;32,33;44) from movement in a predetermined path with respect to the keep member (13;30;41), and the keep member (13;30;41) is displaceable to free the bolt member (9;32,33;44) for said movement, characterised in that the keep member (13;30;41) is displaceable transversely of said path between a first position in which it blocks said path to restrain the bolt member (9;32,33;44) as aforesaid, and a second position in which it is clear of said path to free the bolt member (9;32,33;44) for movement in said path.
2. A lock according to Claim 1 characterised in that the keep member (13;30) has an upstanding wall (15) that serves to block said path when the keep member (13;30) is in its said first position, and that the wall (15) is apertured (14) such as to enable the bolt member (9;32,33) to pass out from behind said wall (15) when the keep member (13;30) is in its said second position.
3. A lock according to Claim 2 characterised in that the keep member (13;30) is located behind a fixed strike member (10;29) that provides an abutment for the keep member (13;30) in blocking said path, and that the strike member (10;29) is apertured correspondingly to the keep member (13;30) such that apertures of the keep and strike members (13,10;30,29) are out of register with one another when the keep member (13;30) is in its said first position and in register with one another when the keep member (13;30) is in its said second position.

4. A lock according to Claim 3 characterised in that the strike member is a channel member (10) within which the keep member (13) slides during displacement between its said first and second positions.

5

5. A lock according to any one of Claims 2 to 4 characterised in that the keep member is a longitudinally-sliding channel member (13;30).

6. A lock according to any one of Claims 2 to 5  
10 characterised in that a latch (19;31) for retaining the keep member (13;30) in its said second position is provided, and that the latch (19;31) is released to enable the keep member (13;30) to move to its said first position in response to entry of the bolt member (9;32) behind said wall (15).

15

7. A lock according to Claim 1 characterised in that the keep member (41) is mounted for angular displacement about an axis that is parallel to the line of said displacement, and that the first and second positions of the keep member (41)  
20 are displaced from one another both longitudinally and angularly with respect to said axis.

8. A lock according to Claim 7 characterised in that the keep member is a cylindrical member (41) that is slotted (43)  
25 to receive the bolt member (44), and that the cylindrical member (41) in receiving the bolt member (44) is angularly displaced about said axis for engaging the bolt member (44) with further axially-directed slotting (46) of the keep member (41), so that longitudinal displacement of the keep  
30 member (41) into its said first position captures the bolt member (44) within the axially-directed slotting (46).

9. A lock according to any one of the preceding claims characterised in that the bolt member comprises a plurality of mutually-spaced pin-bolts (9;32,33;44) or other discrete elements for engaging with the said keep member (13;30;41).  
5
10. A lock according to any one of the preceding claims characterised in that the bolt member (9;32,33;44) is part of a key-operable lock mechanism (1;45) so as to be withdrawable from capture by the keep member (13;30;41) by key operation  
10 of the lock mechanism (1;45).
11. A lock according to any one of the preceding claims characterised in that an electrically-energisable device (17;39) is provided for displacing the keep member (13;30;41)  
15 from one to the other of its said first and second positions.
12. A lock according to any one of the preceding claims characterised in that a manually-operable handle (27;35) for  
20 displacing the keep member (13;30) from one to the other of its said first and second positions.

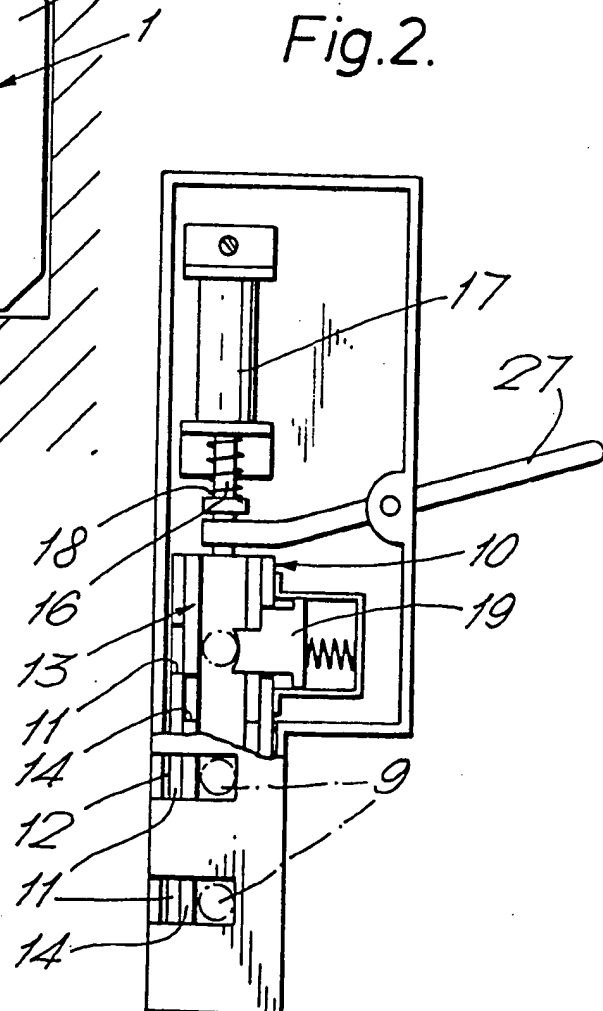
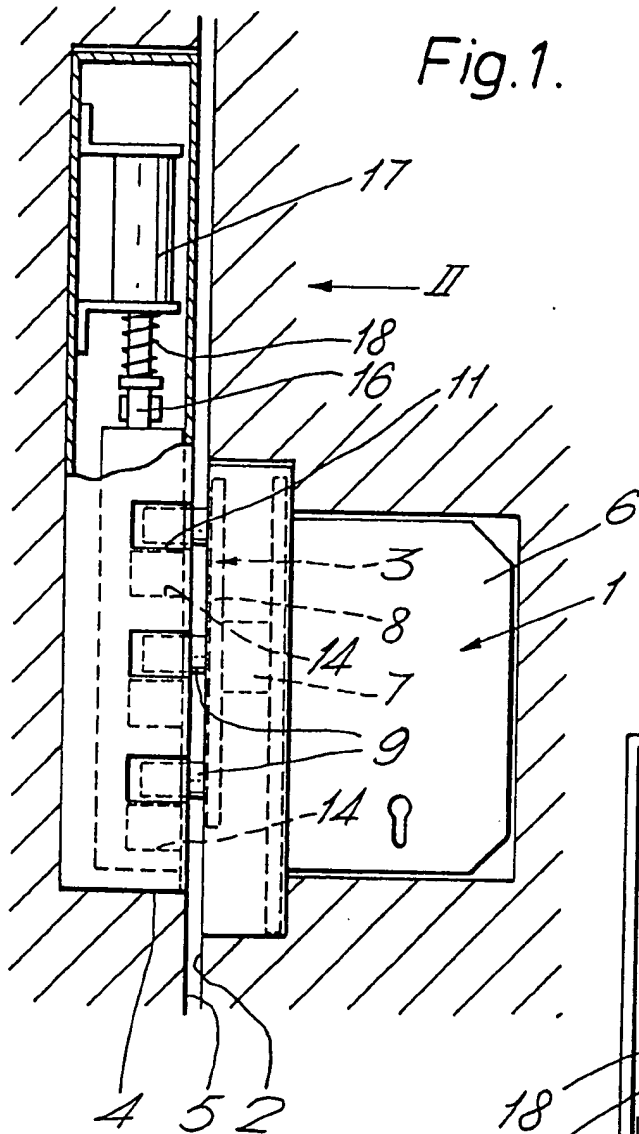


Fig.4.

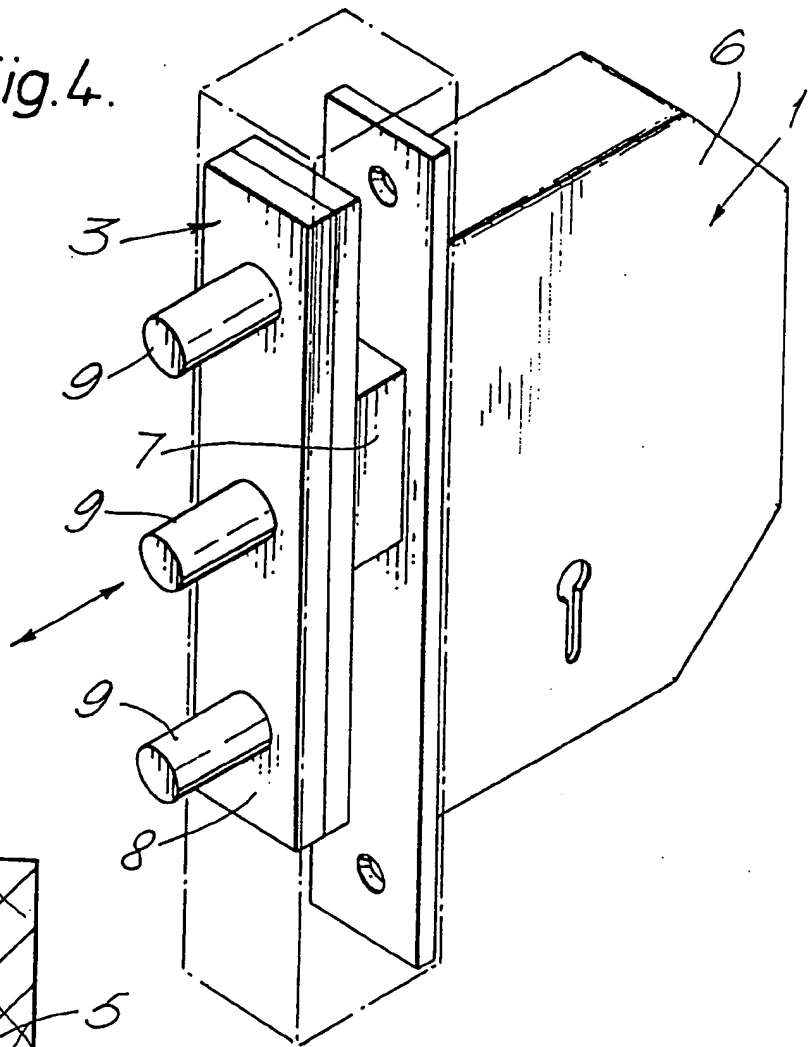


Fig.3.

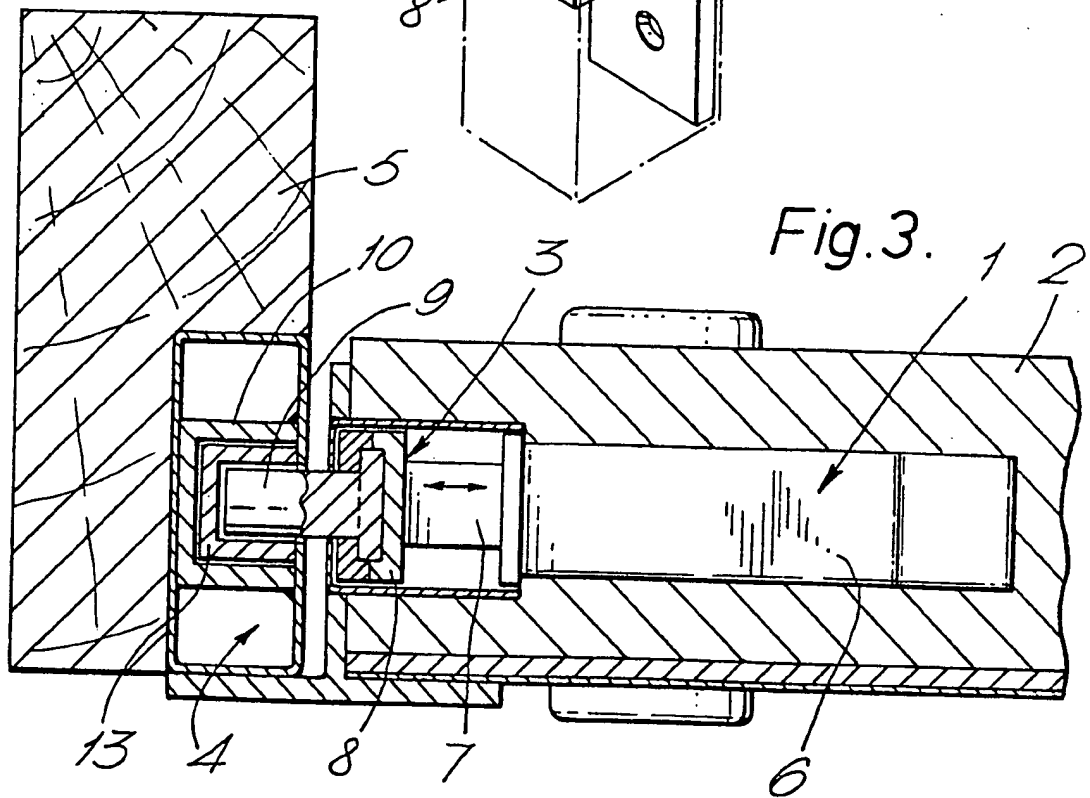




Fig.5.

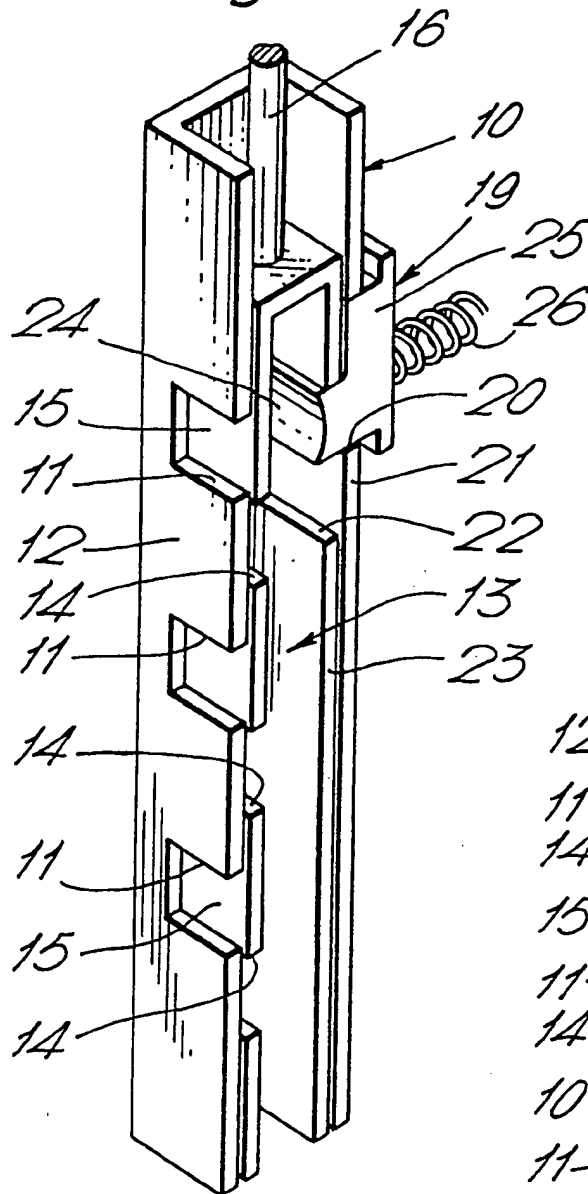
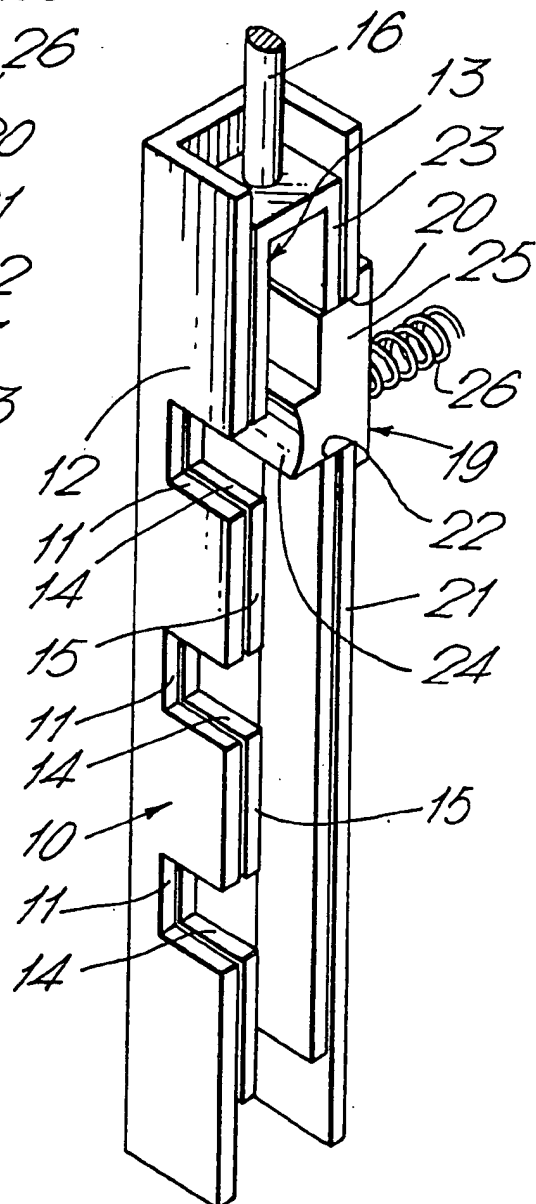


Fig.6.



4/5

Fig. 7.

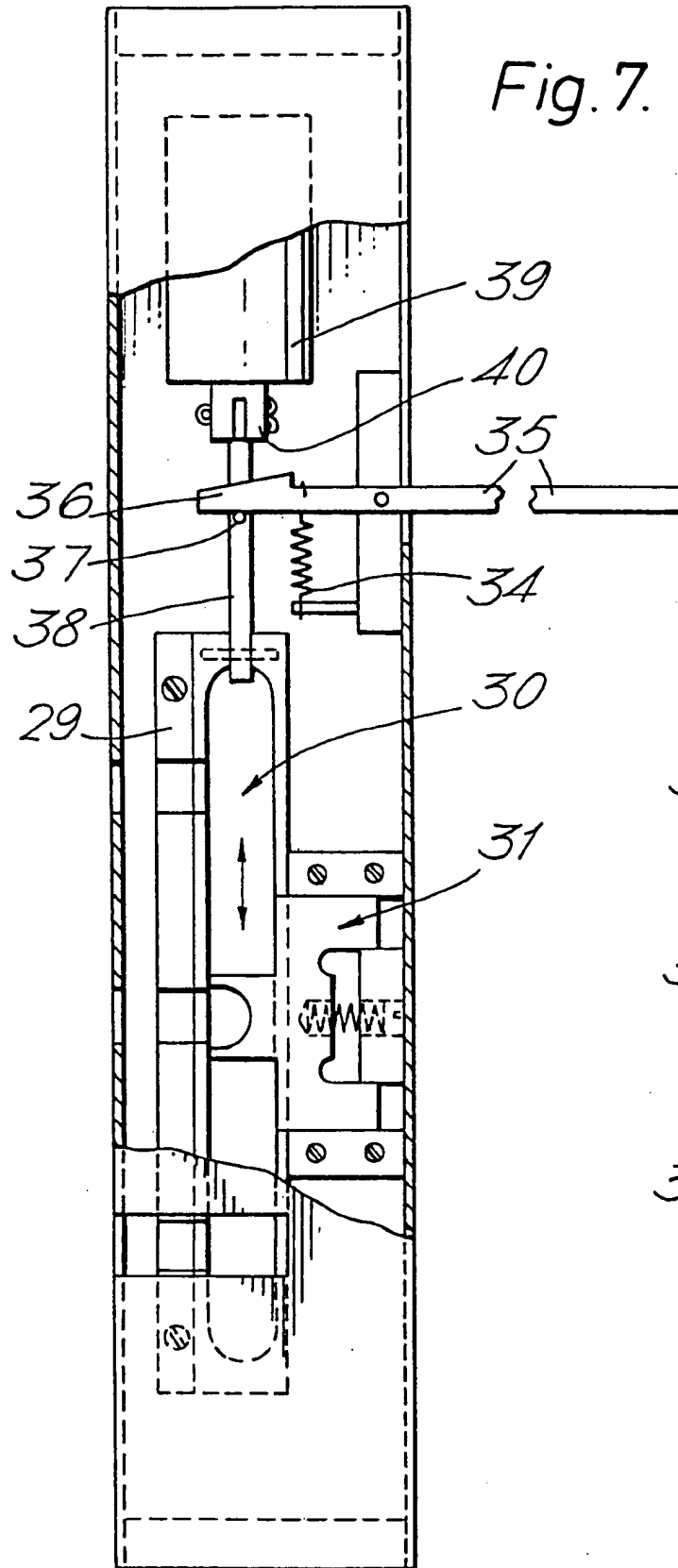


Fig. 8.

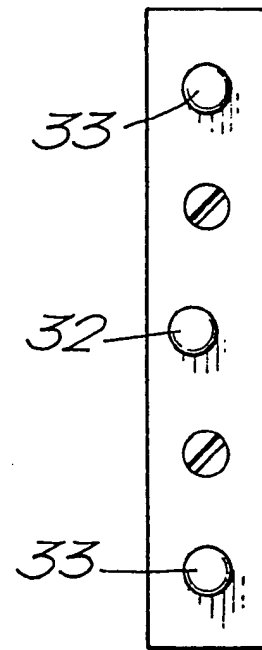
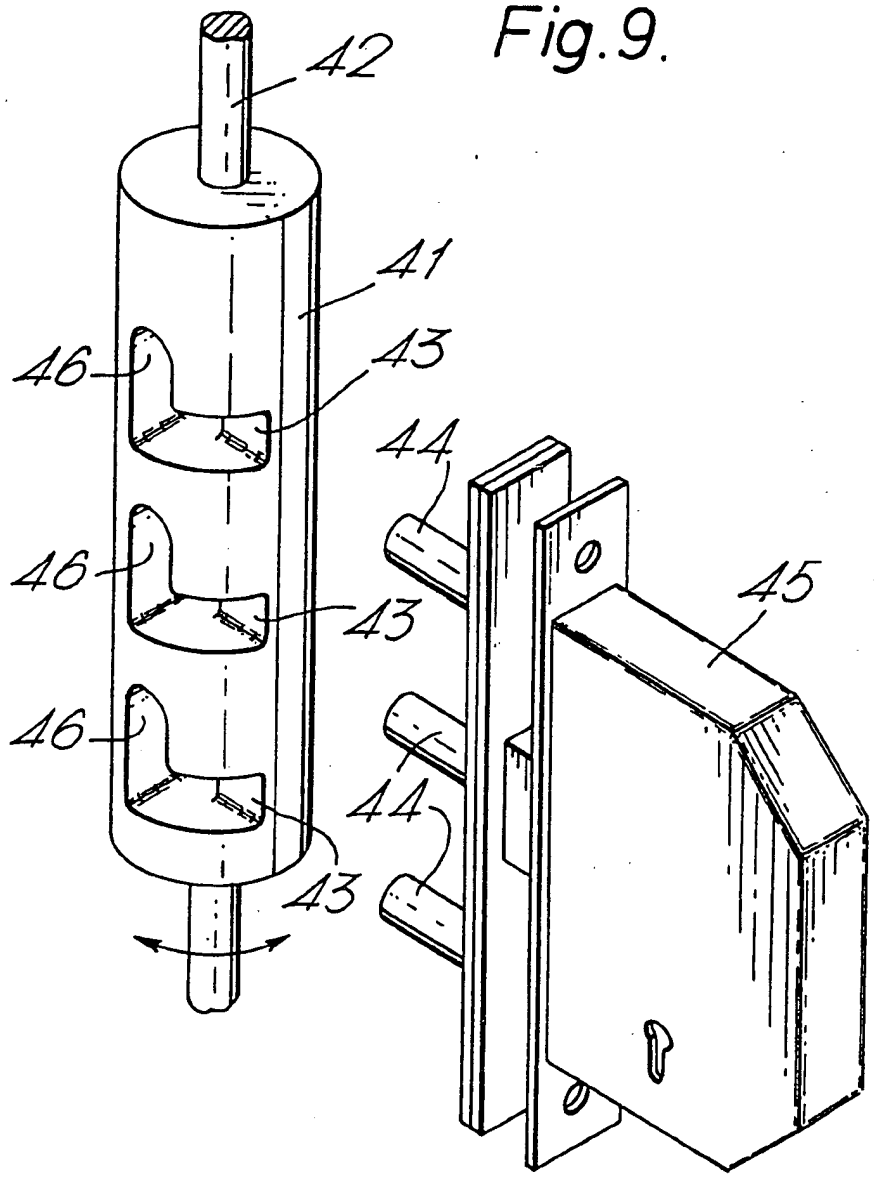


Fig.9.





European Patent  
Office

# EUROPEAN SEARCH REPORT

0134317

Application number

EP 83 20 1291

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)
P, X	GB-A-2 096 687 (NAKANISHI ENGINEERING CO. LTD.) * Complete document *	1, 10, 11	E 05 B 15/00 E 05 B 47/00
A	---	2-5	
X	US-A-4 302 039 (C. DUKE et al.) * Figures 5, 6; column 2, lines 47-68 *	1, 11	
X	DE-C- 186 966 (V. RZANIAK) * Complete document *	1, 10, 11	
A	US-A-4 017 107 (L. HANCHETT) * Complete document *	1, 2, 11	TECHNICAL FIELDS SEARCHED (Int. Cl. 3)  E 05 B 15/00 E 05 B 47/00
-----			
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 12-03-1984	Examiner KRABEL A.W.G.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding	